

CLAIMS

We claim:

1. A catheter system to change the temperature of blood by heat transfer to or from a circulating working fluid, comprising:
 - 5 an inlet lumen to introduce a circulating working fluid; and
 - and
 - an outlet lumen to extract a circulating working fluid, the outlet lumen having a shape that induces mixing in blood flowing past the outlet lumen or in the working fluid.
- 10 2. The catheter system of claim 1, wherein the inlet lumen and the outlet lumen are made of a flexible material.
3. The catheter system of claim 2, wherein the flexible material is a material capable of undergoing inflation.
- 15 4. The catheter system of claim 1, further comprising more than one outlet lumen.
5. The catheter system of claim 1, wherein the working fluid is saline.
- 20 6. The catheter system of claim 1, further comprising a working fluid supply including a pump, and wherein the pump circulates the working fluid.
7. A catheter system to rewarm a patient, comprising:
 - 25 a working fluid supply configured to circulate a working fluid, wherein the working fluid supply is configured to produce a working fluid at a temperature of greater than about 37°C;
 - an inlet lumen to introduce the circulating working fluid; and
 - an outlet lumen to extract the circulating working fluid, the outlet lumen having a shape that induces mixing in blood flowing past the outlet lumen or in the working
 - 30 fluid.

8. A catheter method of inducing a therapeutic state of hypothermia in a patient comprising:

inserting an inflatable heat transfer element, formed by at least an inlet lumen and an outlet lumen, into an artery or vein;

- 5 inflating the inflatable heat transfer element by delivering a working fluid to the inflatable heat transfer element, the temperature of the working fluid lower than that of the blood; and

10 passing the working fluid through a mixing inducing path formed by the outlet lumen, wherein an open path between the inlet lumen and the outlet lumen allows blood flow therethrough, thereby enhancing heat transfer between the working fluid and the blood.

9. A method for warming a body of a patient, comprising:

15 introducing a catheter having an inflatable heat transfer element, formed by at least an inlet lumen and an outlet lumen, the outlet lumen having a mixing inducing shape, into a blood vessel;

20 circulating a working fluid through the heat transfer element, wherein the working fluid is removed from the heat transfer element by passing through the outlet lumen, the working fluid having a temperature greater than the temperature of the blood vessel; and

such that heat is added to the blood to warm the body.